Exercise - I (Conceptual Questions) Build Up Your Understanding

PEAK, AVERAGE AND RMS VALUE

1. What is the r.m.s. value of an alternating current which when passed through a resistor produces heat which is thrice of that produced by a direct current of 2 amperes in the same resistor :-
(1) 6 amp (2) 2 amp
(3) 3.46 amp (4) 0.66 amp

2. The peak value of an alternating e.m.f. which is given by $E = E_0 \cos\omega t$ is 10 volts and its frequency is 50 Hz. At time $t = \frac{1}{600}$ s, the instantaneous e.m.f. is
(1) 10 V (2) $5\sqrt{3}$ V
(3) 5 V (4) 1V

3. The phase difference between current and voltage in an AC circuit is $\frac{\pi}{4}$ radian. If the frequency of AC is 50 Hz, then the phase difference is equivalent to the time difference:-
(1) 0.78 s (2) 15.7 ms
(3) 2.5 s (4) 2.5 ms

4. A current in circuit is given by $i = 3 + 4 \sin \omega t$. Then the effective value of current is :
(1) 5 (2) $\sqrt{7}$
(3) $\sqrt{17}$ (4) $\sqrt{10}$

5. Incorrect statement are :
(a) A.C. meters can measure D.C also
(b) If A.C. meter measures D.C. there scale must be linear and uniform
(c) A.C. and D.C. meters are based on heating effect of current
(d) A.C. meter reads rms value of current
(1) a, b (2) b, c (3) c, d (4) d, a

6. The r.m.s. value of current for a variable current $i = i_1 \cos \omega t + i_2 \sin \omega t$:–
(1) $\frac{1}{\sqrt{2}}(i_1 + i_2)$ (2) $\frac{1}{\sqrt{2}}(i_1 + i_2)^2$
(3) $\frac{1}{\sqrt{2}}(i_1^2 + i_2^2)^{1/2}$ (4) $\frac{1}{2}(i_1^2 + i_2^2)^{1/2}$

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7. The relation between an A.C. voltage source and time in SI units is :
$V = 120 \sin (100 \pi t) \cos (100 \pi t)$ volt
value of peak voltage and frequency will be respectively :–
(1) 120 volt and 100 Hz
(2) $\frac{120}{\sqrt{2}}$ volt and 100 Hz
(3) 60 volt and 200 Hz
(4) 60 volt and 100 Hz

8. If an A.C. main supply is given to be 220 V. What would be the average e.m.f. during a positive half cycle :-
(1) 198 V (2) 386 V
(3) 256 V (4) None of these

9. The hot wire ammeter measures :-
(1) D.C. current
(2) A.C. current
(3) None of above
(4) both (1) & (2)

10. Frequency of A.C. in India is –
(1) 45 Hz
(2) 60 Hz
(3) 50 Hz
(4) None of the above

11. For an alternating current $I = I_0 \cos \omega t$, the rms value and peak value of current is :-
(1) $I_0, \frac{I_0}{\sqrt{2}}$ (2) $\frac{I_0}{\sqrt{2}}, I_0$
(3) $I_0, \frac{I_0}{2}$ (4) $2I_0, \frac{I_0}{\sqrt{2}}$

12. If a step-up transformer have turn ratio 5, frequency 50 Hz root mean square value of potential difference on primary 100 volts and the resistance of the secondary winding is 500 Ω then the peak value of voltage in secondary winding will be (the efficiency of the transformer is hundred percent)
(1) $500\sqrt{2}$ (2) $10\sqrt{2}$
(3) $50\sqrt{2}$ (4) $20\sqrt{2}$

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SIMPLE AC CIRCUIT

13. A resonant A.C. circuit contains a capacitor of capacitance 10^{-6} F and an inductor of 10^{-4} H. The frequency of electrical oscillations will be :-

(1) 10^5 Hz (2) 10 Hz

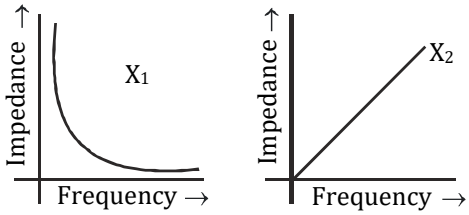
(3) $\frac{10^5}{2\pi}$ Hz (4) $\frac{10}{2\pi}$ Hz

14. A resistance of 300Ω and an inductance of $\frac{1}{\pi}$ henry are connected in series to a A.C. voltage of 20 volts and 200 Hz frequency. The phase angle between the voltage and current is :-

(1) $\tan^{-1}\left(\frac{4}{3}\right)$ (2) $\tan^{-1}\left(\frac{3}{4}\right)$

(3) $\tan^{-1}\left(\frac{3}{2}\right)$ (4) $\tan^{-1}\left(\frac{2}{3}\right)$

15. The graphs given below depict the dependence of two reactive impedances X_1 and X_2 on the frequency of the alternating e.m.f. applied individually to them. We can then say that :



(1) X_1 is an inductor and X_2 is a capacitor

(2) X_1 is a resistor and X_2 is a capacitor

(3) X_1 is a capacitor and X_2 is an inductor

(4) X_1 is an inductor and X_2 is a resistor

16. A 12 ohm resistor and a 0.21 henry inductor are connected in series to an AC source operating at 20 volts, 50 cycle/second. The phase angle between the current and the source voltage is:

(1) 30° (2) 40°

(3) 80° (4) 90°

17. A 110 V, 60 W lamp is run from a 220 V AC mains using a capacitor in series with the lamp, instead of a resistor then the voltage across the capacitor is about:-

(1) 110 V (2) 190 V

(3) 220 V (4) 311 V

18. The resistance that must be connected in series with inductance of 0.2 H in order that the phase difference between current and e.m.f. may be 45° when the frequency is 50 Hz, is:-

(1) 6.28 ohm. (2) 62.8 ohm.

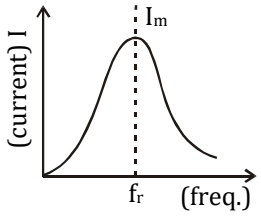
(3) 628 ohm. (4) 31.4 ohm.

19. A student connects a long air cored - coil of manganin wire to a 100 V D.C. supply and records a current of 25 amp. When the same coil is connected across 100 V. 50 Hz a.c. the current reduces to 20 A , the reactance of the coil is :-

(1) 4 Ω (2) 3 Ω

(3) 5 Ω (4) None

20. The graph shows variation of I with f for a series R-L-C network. Keeping L and C constant, if R decreases :



(a) Maximum current (I_m) increases

(b) Sharpness of the graph increases

(c) Quality factor increases

(d) Band width increases

(1) a, b, c (2) b, c, d

(3) c, d, a (4) All

21. Alternating current is flowing in inductance L and resistance R. The frequency of source is $\omega/2\pi$. Which of the following statement is correct :

(1) For low frequency the limiting value of impedance is L.

(2) For high frequency the limiting value of impedance is ωL.

(3) For high frequency the limiting value of impedance is R.

(4) For low frequency the limiting value of impedance is ωL.

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22. A bulb and a capacitor are connected in series to a source of alternating current. If its frequency is increased, while keeping the voltage of the source constant, then
(1) Bulb will give more intense light.
(2) Bulb will give less intense light.
(3) Bulb will give light of same intensity as before
(4) Bulb will stop radiating light.

23. In an A.C. circuit resistance and inductance are connected in series. The potential and current in inductance is:
(1) $V_0 \sin \omega t, \frac{V_0}{\omega L} \sin\omega t$
(2) $V_0 \sin \omega t, \frac{V_0}{\omega L} \sin(\omega t + \pi/2)$
(3) $V_0 \sin (\omega t + \pi/2), \frac{V_0}{\omega L} \sin\omega t$
(4) $V_0 \sin(\omega t + \pi/2), \frac{V_0}{\omega L} \sin(\omega t - \pi/2)$

24. An a.c. source of voltage V and of frequency 50 Hz is connected to an inductor of 2H and negligible resistance. A current of r.m.s value I flows in the coil. When the frequency of the voltage is changed to 400 Hz keeping the magnitude of V the same, the current is now :-
(1) 8I in phase with V
(2) 4I and leading by 90° from V
(3) $\frac{I}{4}$ and lagging by 90° from V
(4) $\frac{I}{8}$ and lagging by 90° from V

25. A capacitor of capacity C is connected in A.C. circuit. The applied emf is $V=V_0 \sin\omega t$, then the current is :
(1) $I = \frac{V_0}{\omega L} \sin\omega t$
(2) $I = \frac{V_0}{\omega L} \sin(\omega t + \pi/2)$
(3) $I = V_0 \omega C \sin\omega t$
(4) $I = V_0 \omega C \sin (\omega t + \pi/2)$

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26. The impedence of a circuit, when a resistance R and an inductor of inductance L are connected in series in an A.C. circuit of frequency (f) is :-
(1) $\sqrt{R + 4\pi f L^2}$ (2) $\sqrt{R + 4\pi^2 f^2 L^2}$
(3) $\sqrt{R^2 + 4\pi^2 f^2 L^2}$ (4) $\sqrt{R^2 + 2\pi^2 f^2 L^2}$

27. A capacitor of capacity C and reactance X if capacitance and frequency become double then reactance will be :–
(1) 4X (2) $\frac{X}{2}$
(3) $\frac{X}{4}$ (4) 2X

28. The coil of choke in a circuit :
(1) increases the current
(2) controls the current
(3) has high resistance to d.c. circuit
(4) does not change the current

29. The inductive reactance of an inductive coil with $\frac{1}{\pi}$ henry and 50 Hz :–
(1) $\frac{50}{\pi}$ ohm (2) $\frac{\pi}{50}$ ohm
(3) 100 ohm (4) 50 ohm

30. In the L–R circuit R = 10Ω and L = 2H. If 120V, 60Hz alternating voltage is applied then the flowing current in this circuit will be :-
(1) 0.32 A (2) 0.16 A
(3) 0.48 A (4) 0.80 A

31. An inductance of 0.4 Henry and a resistance of 100 ohm are connected to a A.C. voltage source of 220 V and 50 Hz. Then find out the phase difference between the voltage and current flowing in the circuit :
(1) $\tan^{-1}(2.25\,\pi)$ (2) $\tan^{-1}(0.4\,\pi)$
(3) $\tan^{-1}(1.5\,\pi)$ (4) $\tan^{-1}(0.5\,\pi)$

32. A capacitor of capacitance 100 μF & a resistance of 100Ω is connected in series with AC supply of 220V, 50Hz. The current leads the voltage by
(1) $\tan^{-1}\left(\frac{1}{2\pi}\right)$ (2) $\tan^{-1}\left(\frac{1}{\pi}\right)$
(3) $\tan^{-1}\left(\frac{2}{\pi}\right)$ (4) $\tan^{-1}\left(\frac{4}{\pi}\right)$

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33. If the current through an inductor of inductance L is given by $I = I_0 \sin\omega t$, then the voltage across inductor will be :-

(1) $I_0 \omega L \sin(\omega t - \pi/2)$

(2) $I_0 \omega L \sin(\omega t + \pi/2)$

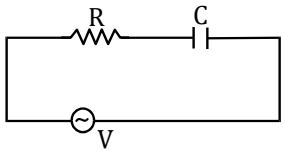
(3) $I_0 \omega L \sin(\omega t - \pi)$

(4) None of these

34. There is a 5 Ω resistance in an A.C. circuit. Inductance of 0.1 H is connected with it in series. If equation of A.C. e.m.f. is $V = 5 \sin 50t$ then the phase difference between current and e.m.f. is :-

(1) $\frac{\pi}{2}$ (2) $\frac{\pi}{6}$ (3) $\frac{\pi}{4}$ (4) 0

35. A 50 Hz a.c. source of 20V is connected across R and C as shown in figure below. The voltage across R is 12V. The voltage across C is



(1) 8 V

(2) 16V

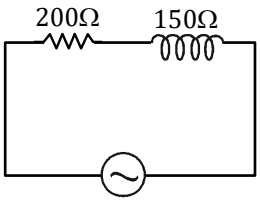
(3) 10 V

(4) Not possible to determine unless values of R and C are given

36. 200 Ω resistance and 1H inductance is connected in series with an A.C. circuit. The frequency of the source is $\frac{200}{2\pi}$ Hz. Then phase difference in between V and I will be :-

(1) 30° (2) 60° (3) 45° (4) 90°

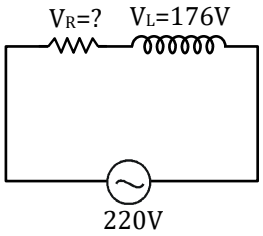
37. Impedance of the following circuit will be :



(1) 150Ω (2) 200Ω

(3) 250Ω (4) 340Ω

38. In the figure shown, find V_R :



(1) 132V (2) 396V

(3) 185 V (4) $\sqrt{220\times176}$V

39. If alternating current of 60 Hz frequency is flowing through inductance of L = 1 mH and drop in ΔV_L is 0.6 V then alternating current :-

(1) $\frac{1}{\pi}$A (2) $\frac{5}{\pi}$A (3) $\frac{50}{\pi}$A (4) $\frac{20}{\pi}$A

LCR SERIES CIRCUIT, RESONANCE

40. An inductance of 1mH, a condenser of 10μF and a resistance of 50Ω are connected in series. The reactance of inductor and condensers are same. The reactance of either of them will be :-

(1) 100 Ω (2) 30 Ω

(3) 3.2 Ω (4) 10 Ω

41. L, C and R represent physical quantities inductance, capacitance and resistance respectively. The combination representing dimension of frequency is

(1) LC (2) $(LC)^{-1/2}$

(3) $\left(\frac{L}{C}\right)^{-1/2}$ (4) $\frac{C}{L}$

42. A circuit contains R, L and C connected in series with an A. C. source. The values of the reactance for inductor and capacitor are 200Ω and 600Ω respectively and the impedance of the circuit is Z_1. What happens to the impedance of the same circuit if the values of the reactance are interchanged:-

(1) The impedance will remain unchanged

(2) The impedance will increase

(3) The impedance will decrease

(4) Information insufficient

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43. When V = 100 sinωt is applied across a series (R-L-C) circuit, at resonance the current in resistance (R = 100 Ω) is i = i_0 sinωt, then power dissipation in circuit is:-
(1) 50 W
(2) 100 W
(3) 25 W
(4) Can't be calculated

44. At resonance in a series LCR circuit, which of the following statements is true: -
(1) Current in the circuit is maximum and phase difference between E and I is π/2
(2) Current in the circuit is maximum and phase difference between E and I is zero
(3) Voltage is maximum and phase difference between E and I is π/2
(4) Current is minimum and phase difference between E and I is zero

45. An alternating voltage is connected in series with a resistance R and an inductance L. If the potential drop across the resistance is 200 volt and across the inductance is 150 volt, the applied voltage:
(1) 350 volt (2) 250 volt
(3) 500 volt (4) 300 volt

46. For a series R-L-C circuit :-
(a) Voltage across L and C are differ by π
(b) Current through L and R are in same phase
(c) Voltage across R and L differ by π/2
(d) Voltage across L and current through C are differ by π/2
(1) a, b, c (2) b, c, d
(3) c, d, a (4) All

47. A series R–L–C (R = 10Ω, X_L = 20Ω, X_C = 20 Ω) circuit is supplied by V = 10 sin ωt volt then power dissipation in circuit is :-
(1) Zero (2) 10 W
(3) 5 W (4) 2.5 W

48. The self inductance of the motor of an electric fan is 10 H. In order to impart maximum power at 50Hz. It should be connected to a capacitance of :
(1) 2×10^{-6} F (2) 3×10^{-6} F
(3) 10^{-4} F (4) 10^{-6} F

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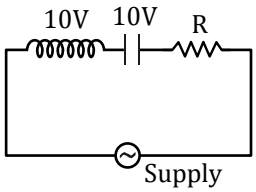
49. In a series resonant R-L-C circuit, if L is increased by 25% and C is decreased by 20%, then the resonant frequency will :
(1) Increases by 10%
(2) Decreases by 10%
(3) Remain unchanged
(4) Increases by 2.5%

50. The value of quality factor is :-
(ω_0 : resonating frequency)
(1) $\frac{\omega_0 L}{R}$ (2) $\frac{\omega_0}{RC}$ (3) $\sqrt{LC}$ (4) L/R

51. If value of R is changed, then :-

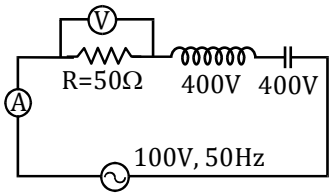


(1) Voltage across L remains same
(2) Voltage across C remains same
(3) Voltage across LC combination remains same
(4) Voltage across LC combination changes

52. In a series LCR circuit voltage across resistor, inductor and capacitor are 1V, 3V and 2V respectively. At the instant t when the source voltage is given by :
V = V_0 cos ωt, the current in the circuit will be :
(1) $I = I_0 \cos\left(\omega t + \frac{\pi}{4}\right)$ (2) $I = I_0 \cos\left(\omega t - \frac{\pi}{4}\right)$
(3) $I = I_0 \cos\left(\omega t + \frac{\pi}{3}\right)$ (4) $I = I_0 \cos\left(\omega t - \frac{\pi}{3}\right)$

53. In an AC Circuit decrease in impedance with increase in frequency indicates that circuit has/have :-
(1) Only resistance
(2) Resistance & inductance.
(3) Resistance & capacitance
(4) Resistance, capacitance & inductance.

54. In given LCR circuit, the voltage across the terminals of a resistance & current will be–



(1) 400V, 2A (2) 800V, 2A
(3) 100V, 2A (4) 100V, 4A

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55. Phase of current in LCR circuit –
(1) Is in the phase of potential
(2) Leading from the phase of potential
(3) Lagging from the phase of potential
(4) Before resonance frequency, leading from the phase of potential and after resonance frequency, lagging from the phase of potential

56. In LCR circuit, the voltage across the terminals of a resistance, inductance & capacitance are 40V, 30V & 60V, then the voltage across the main source will be –
(1) 130 volt (2) 100 volt
(3) 70 volt (4) 50 volt

57. For an alternating current of frequency $\frac{500}{\pi}$ Hz in L-C-R series circuit with L = 1H, C = 1 μF, R = 100Ω, impedance is :-
(1) 100 Ω (2) $100\sqrt{\pi}\,\Omega$
(3) $100\sqrt{2\pi}\,\Omega$ (4) $100\,\pi\,\Omega$

POWER IN AC CIRCUIT

58. A sinusoidal A.C. current flows through a resistor of resistance R. If the peak current is I_P, then the power dissipated is :-
(1) $I_p^2 R\cos\theta$ (2) $\frac{1}{2} I_p^2 R$
(3) $\frac{4}{\pi} I_p^2 R$ (4) $\frac{1}{\pi^2} I_p^2 R$

59. An AC circuit draws 5A at 160 V and the power consumption is 600 W. Then the power factor is:-
(1) 1 (2) 0.75
(3) 0.50 (4) Zero

60. Which is not correct for average power P at resonance :
(1) $P=I_{rms}\,V_{rms}$ (2) $P = \frac{V}{\sqrt{2}}\frac{I}{\sqrt{2}}$
(3) P = VI (4) $P=I^2_{rms}\,R$

61. In an A.C. circuit inductance, capacitance and resistance are connected. If the effective voltage across inductance is V_L, across capacitance is V_c and across resistance is V_R, then the total effective value of voltage is :
(1) $V_R+V_L+V_c$ (2) $V_R+V_L-V_c$
(3) $\sqrt{V_R^2+(V_L-V_C)^2}$ (4) $\sqrt{V_R^2-(V_L-V_C)^2}$

62. In an a.c. circuit V and I are given by
V = 100 sin (100 t) volts
I = 100 sin (100t + π/3) mA
The power dissipated in the circuit is
(1) 10^4 watt (2) 10 watt
(3) 2.5 watt (4) 5.0 watt

63. For a series LCR circuit the power loss at resonance is :-
(1) $\frac{V^2}{\left[\omega L-\frac{1}{\omega C}\right]}$ (2) $I^2L\omega$
(3) I^2R (4) $\frac{V^2}{C\omega}$

64. In an alternating circuit applied voltage and current are $E = E_0 \sin\omega t$ and $I = I_0 \sin(\omega t+\pi/2)$ respectively. Then the power consumed in the circuit will be :
(1) Zero (2) $E_0I_0/2$
(3) $E_0I_0/\sqrt{2}$ (4) $E_0I_0/4$

65. In which of the following case power factor will be negligible :–
(1) Inductance and resistance both high
(2) Inductance and resistance both low.
(3) Low resistance and high inductance
(4) High resistance and low inductance

66. If V = 100 sin100t volt, and
I = 100 $\sin(100t + \frac{\pi}{6})$ A. then find the watt less power in watt :-
(1) 10^4 (2) 10^3
(3) 10^2 (4) 2.5×10^3

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67. An A.C. supply gives 30V r.m.s. voltage which passes through a 10Ω resistance. The power dissipated in it is :-

(1) $90\sqrt{2}$ W (2) 90W

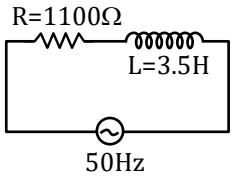
(3) $45\sqrt{2}$ W (4) 45 W

68. An inductor of inductance L and resistor of resistance R are joined in series and connected by a source of frequency ω. Power dissipated in the circuit is :-

(1) $\frac{\left(R^2+\omega^2L^2\right)}{V}$ (2) $\frac{V^2R}{\left(R^2+\omega^2L^2\right)}$

(3) $\frac{V}{\left(R^2+\omega^2L^2\right)}$ (4) $\frac{\sqrt{R^2+\omega^2L^2}}{V^2}$

69. For given circuit the power factor is :



(1) 0 (2) 1/2

(3) $1/\sqrt{2}$ (4) None of these

70. In a purely capacitive circuit average power dissipated in the circuit is -

(1) $V_{rms}\, I_{rms}$

(2) Depends on capacitance

(3) Infinite

(4) Zero

71. Energy loss in pure capacitance in A.C. circuit is

(1) $\frac{1}{2}CV^2$ (2) CV

(3) $\frac{1}{4}CV^2$ (4) Zero

72. Power dissipated in pure inductance will be :

(1) $\frac{LI^2}{2}$ (2) $2LI^2$

(3) $\frac{LI^2}{4}$ (4) Zero

73. The power factor of L-R circuit is :

(1) $\frac{\omega L}{R}$ (2) $\frac{R}{\sqrt{(\omega L)^2+R^2}}$

(3) ωLR (4) $\sqrt{\omega LR}$

74. If alternating current of rms value 'a' flows through resistance R then power loss in resistance is :

(1) Zero (2) a^2R

(3) $\frac{a^2R}{2}$ (4) $2a^2R$

75. Which of the following device in alternating circuit provides maximum power :-

(1) Only capacitor

(2) Capacitor and resistor

(3) Only inductor

(4) Only resistor

LC OSCILLATION

76. Comparing the L–C oscillations with the oscillations of a spring–block system (force constant of spring = k and mass of block = m), the physical quantity mk is similar to :–

(1) CL (2) $\frac{1}{CL}$

(3) $\frac{C}{L}$ (4) $\frac{L}{C}$

77. In an oscillating LC circuit the maximum charge on the capacitor is Q. The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is-

(1) Q/2 (2) $Q/\sqrt{3}$

(3) $Q/\sqrt{2}$ (4) Q

78. A fully charged capacitor C with initial charge q_0 is connected to a coil of self inductance L at t = 0. The time at which the energy is stored equally between the electric and the magnetic fields is :-

(1) $2\pi\sqrt{LC}$ (2) $\sqrt{LC}$

(3) $\pi\sqrt{LC}$ (4) $\frac{\pi}{4}\sqrt{LC}$

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79. A LC circuit is in the state of resonance. if C = 0.1 μF and L = 0.25 henry. Neglecting ohmic resistance of circuit what is the frequency of oscillations

(1) 1007 Hz (2) 100 Hz

(3) 109 Hz (4) 500 Hz

80. A 60 μF capacitor is charged to 100 volts. This charged capacitor is connected across a 1.5 mH coil, so that LC oscillations occur. The maximum current in the coil is :-

(1) 1.5 A (2) 2 A

(3) 15 A (4) 20 A

EXERCISE-I (Conceptual Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	3	2	4	3	2	3	4	1	4	3	2	1	3	1	3
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	3	2	2	2	1	2	1	3	4	4	3	3	2	3	2
Question	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Answer	2	2	2	3	2	3	3	1	2	4	2	1	1	2	2
Question	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Answer	4	3	4	3	1	3	2	3	3	4	4	1	2	2	3
Question	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Answer	3	3	3	1	3	4	2	2	3	4	4	4	2	2	4
Question	76	77	78	79	80										
Answer	4	3	4	1	4										

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Exercise - II (Previous Year Questions) AIPMT/NEET

AIPMT 2006

1. A transistor-oscillator using a resonant circuit with an inductor L (of negligible resistance) and a capacitor C in series produce oscillations of frequency f. If L is doubled and C is changed to 4C, then frequency will be :-

(1) $\frac{f}{4}$ (2) 8 f

(3) $\frac{f}{2\sqrt{2}}$ (4) $\frac{f}{2}$

2. A coil of inductive reactance 31Ω has a resistance of 8Ω. It is placed in series with a condenser of capacitive reactance 25Ω. The combination is connected to an a.c. source of 110 volt. The power factor of the circuit is :-

(1) 0.56 (2) 0.64

(3) 0.80 (4) 0.33

AIPMT 2007

3. What is the value of inductance L for which the current is a maximum in a series LCR circuit with C = 10 μF and ω = 1000 rad/s ?

(1) 10mH

(2) 100mH

(3) 1mH

(4) cannot be calculated unless R is known

AIPMT 2008

4. In an a.c. circuit the e.m.f. (e) and the current (i) at any instant are given by :-

$e = E_0 \sin\omega t$ $i = I_0 \sin(\omega t - \phi)$

The average power in the circuit over one cycle of a.c. is :-

(1) $\frac{E_0 I_0}{2}\cos\phi$ (2) $E_0 I_0$

(3) $\frac{E_0 I_0}{2}$ (4) $\frac{E_0 I_0}{2}\sin\phi$

AIPMT 2009

5. Power dissipated in an LCR series circuit connected to an a.c. source of emf ε is :-

(1) $\varepsilon^2 R \Big/ \sqrt{R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2}$

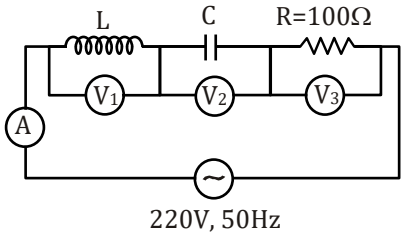
(2) $\varepsilon^2 R \Big/ \left[R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2\right]$

(3) $\varepsilon^2 \sqrt{\left[R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2\right]} \Big/ R$

(4) $\frac{\varepsilon^2\left[R^2 + \left(L\omega - \frac{1}{C\omega}\right)^2\right]}{R}$

AIPMT Pre. 2010

6. In the given circuit the reading of voltmeter V_1 and V_2 are 300 volts each. The reading of the voltmeter V_3 and ammeter A are respectively :



(1) 100 V, 2.0 A (2) 150 V, 2.2 A

(3) 220 V, 2.2 A (4) 220 V, 2.0 A

AIPMT Mains 2010

7. A condenser of capacity C is charged to a potential difference of V_1. The plates of the condenser are then connected to an ideal inductor of inductance L. The current through the inductor when the potential difference across the condenser reduces to V_2 is?

(1) $\frac{C\left(V_1^2 - V_2^2\right)}{L}$ (2) $\frac{C\left(V_1^2 + V_2^2\right)}{L}$

(3) $\left(\frac{C\left(V_1^2 - V_2^2\right)}{L}\right)^{1/2}$ (4) $\left(\frac{C\left(V_1 - V_2\right)^2}{L}\right)^{1/2}$

AIPMT Pre. 2011

8. An ac voltage is applied to a resistance R and an inductor L in series. If R and the inductive reactance are both equal to 3Ω, the phase difference between the applied voltage and the current in the circuit is :-

(1) π/6 (2) π/4 (3) π/2 (4) Zero

9. In an ac circuit an alternating voltage $e = 200\sqrt{2}\sin 100\,t$ volts is connected to a capacitor of capacity 1μF. The r.m.s. value of the current in the circuit is:-

(1) 10 mA (2) 100 mA

(3) 200 mA (4)20 mA

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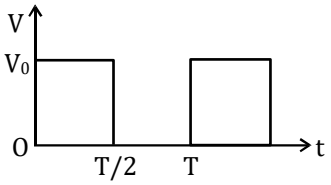
AIPMT Mains 2011

10. The r.m.s. value of potential difference V shown in the figure is: -



(1) $\frac{V_0}{\sqrt{3}}$ (2) V_0

(3) $\frac{V_0}{\sqrt{2}}$ (4) $\frac{V_0}{2}$

11. A coil has resistance 30 ohm and inductive reactance 20 ohm at 50 Hz frequency. If an ac source, of 200 volt, 100 Hz, is connected across the coil, the current in the coil will be :-

(1) 2.0 A (2) 4.0 A

(3) 8.0 A (4) $\frac{20}{\sqrt{13}}$ A

AIPMT Pre. 2012

12. In an electrical circuit R, L, C and an a.c. voltage source are all connected in series. When L is removed from the circuit, the phase difference between the voltage and the current in the circuit is $\pi/3$. If instead, C is removed from the circuit the phase difference is again $\pi/3$. The power factor of the circuit is :

(1) 1 (2) $\sqrt{3}/2$

(3) $\frac{1}{2}$ (4) $\frac{1}{\sqrt{2}}$

AIPMT Mains 2012

13. The instantaneous values of alternating current and voltages in a circuit are given as

$i = \frac{1}{\sqrt{2}} \sin(100\pi t)$ ampere

$e = \frac{1}{\sqrt{2}} \sin(100\pi t + \pi/3)$ volt

The average power in Watts consumed in the circuit is :-

(1) $\frac{1}{2}$ (2) $\frac{1}{8}$

(3) $\frac{1}{4}$ (4) $\frac{\sqrt{3}}{4}$

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NEET-UG 2013

14. A coil of self-inductance L is connected in series with a bulb B and an AC source. Brightness of the bulb decreases when :

(1) an iron rod is inserted in the coil.

(2) frequency of the AC source is decreased.

(3) number of turns in the coil is reduced.

(4) A capacitance of reactance $X_C = X_L$ is included in the same circuit.

Re-AIPMT 2015

15. A series R-C circuit is connected to an alternating voltage source. Consider two situations:

(a) When capacitor is air filled.

(b) When capacitor is mica filled.

Current through resistor is i and voltage across capacitor is V then :-

(1) $V_a = V_b$ (2) $V_a < V_b$

(3) $V_a > V_b$ (4) $i_a > i_b$

AIPMT 2015

16. A resistance 'R' draws power 'P' when connected to an AC source. If an inductance is now placed in series with the resistance, such that the impedance of the circuit becomes 'Z', the power drawn will be:

(1) $P\sqrt{\frac{R}{Z}}$ (2) $P\left(\frac{R}{Z}\right)$

(3) P (4) $P\left(\frac{R}{Z}\right)^2$

NEET-I 2016

17. An inductor 20 mH, a capacitor 50 μF and a resistor 40Ω are connected in series across a source of emf V = 10 sin 340 t. The power loss in A.C. circuit is:-

(1) 0.51 W (2) 0.67 W

(3) 0.76 W (4) 0.89 W

18. A small signal voltage $V(t) = V_0 \sin\omega t$ is applied across an ideal capacitor C :-

(1) Current I(t), lags voltage V(t) by 90°.

(2) Over a full cycle the capacitor C does not consume any energy from the voltage source.

(3) Current I(t) is in phase with voltage V(t).

(4) Current I(t) leads voltage V(t) by 180°.

NEET-II 2016

19. Which of the following combinations should be selected for better tuning of an L-C-R circuit used for communication?

(1) R = 15 Ω, L = 3.5 H, C = 30 μF

(2) R = 25 Ω, L = 1.5 H, C = 45 μF

(3) R = 20 Ω, L = 1.5 H, C = 35 μF

(4) R = 25 Ω, L = 2.5 H, C = 45 μF

20. The potential differences across the resistance, capacitance and inductance are 80 V, 40 V and 100 V respectively in an L-C-R circuit. The power factor of this circuit is :-

(1) 0.8 (2) 1.0 (3) 0.4 (4) 0.5

NEET (UG) 2018

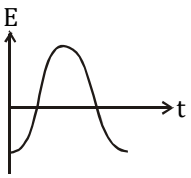
21. An inductor 20 mH, a capacitor 100 μF and a resistor 50 Ω are connected in series across a source of emf, V = 10 sin 314 t. The power loss in the circuit is

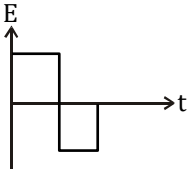
(1) 0.79 W (2) 0.43 W

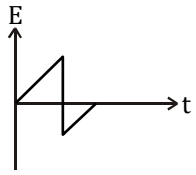
(3) 2.74 W (4) 1.13 W

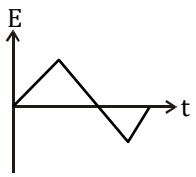
NEET (UG) 2019 (Odisha)

22. The variation of EMF with time for four types of generators are shown in the figures. Which amongst them can be called AC?

(a) 

(b) 

(c) 

(d) 

(1) (a) & (d) (2) (a), (b), (c) & (d)

(3) (a) & (b) (4) only (a)

23. A circuit when connected to an AC source of 12 V gives a current of 0.2 A. The same circuit when connected to a DC source of 12 V, gives a current of 0.4 A. The circuit is

(1) series LR (2) series RC

(3) series LC (4) series LCR

NEET (UG) 2020

24. A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :

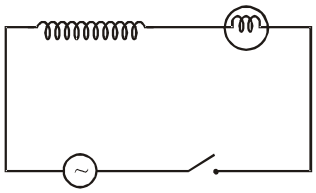
(1) 25.1 A (2) 1.7 A (3) 2.05 A (4) 2.5 A

25. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is :

(1) –1.0 (2) zero (3) 0.5 (4) 1.0

NEET (UG) 2020(Covid-19)

26. A light bulb and an inductor coil are connected to an ac source through a key as shown in the figure below. The key is closed and after sometime an iron rod is inserted into the interior of the inductor. The glow of the light bulb



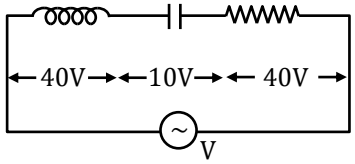
(1) decreases (2) remains unchanged

(3) will fluctuate (4) increases

NEET (UG) 2021

27. An inductor of inductance L, a capacitor of capacitance C and a resistor of resistance 'R' are connected in series to an ac source of potential difference 'V' volts as shown in figure.

Potential difference across L, C and R is 40 V, 10 V and 40 V, respectively. The amplitude of current flowing through LCR series circuit is $10\sqrt{2}$ A. The impedance of the circuit is :-



(1) $4\sqrt{2}\,\Omega$ (2) $5/\sqrt{2}\,\Omega$

(3) 4 Ω (4) 5 Ω

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28. A series LCR circuit containing 5.0 H inductor, 80 μF capacitor and 40 Ω resistor is connected to 230 V variable frequency ac source. The angular frequencies of the source at which power transferred to the circuit is half the power at the resonant angular frequency are likely to be :

(1) 25 rad/s and 75 rad/s

(2) 50 rad/s and 25 rad/s

(3) 46 rad/s and 54 rad/s

(4) 42 rad/s and 58 rad/s

NEET (UG) 2022

29. The peak voltage of the ac source is equal to:

(1) the rms value of the ac source

(2) $\sqrt{2}$ times the rms value of the ac source

(3) $1/\sqrt{2}$ time the rms value of the ac source

(4) the value of voltage supplied to the circuit.

30. A series LCR circuit with inductance 10H, capacitance 10 μF, resistance 50 Ω is connected to an ac source of voltage, V = 200 sin (100 t) volt. If the resonant frequency of the LCR circuit is ν_o and the frequency of the ac source is ν, then

(1) $\nu_o = \nu = \frac{50}{\pi}$ Hz

(2) $\nu_o = \frac{50}{\pi}$ Hz, $\nu = 50$ Hz

(3) $\nu = 100$ Hz ; $\nu_o = \frac{100}{\pi}$ Hz

(4) $\nu_o = \nu = 50$ Hz

RE-NEET (UG) 2022

31. An inductor of inductance 2 mH is connected to a 220 V, 50 Hz a.c. source. Let the inductive reactance in the circuit is X_1. If a 220 V dc source replaces the ac source in the circuit, then the inductive reactance in the circuit is X_2. X_1 and X_2 respectively are :

(1) 6.28 Ω, zero (2) 6.28 Ω, infinity

(3) 0.628 Ω, zero (4) 0.628 Ω, infinity

32. A standard filament lamp consumes 100 W when connected to 200 V ac mains supply. The peak current through the bulb will be :

(1) 0.707 A (2) 1 A

(3) 1.414 A (4) 2 A

EXERCISE-II (Previous Year Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Answer	3	3	2	1	2	3	3	2	4	3	2	1	2	1	3
Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Answer	4	1	2	1	1	1	2	1	4	4	1	4	3	2	1
Question	31	32													
Answer	3	1													

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Exercise – III (Analytical Questions) Master Your Understanding

1. Resonance occurs in a series LCR circuit when the frequency of the applied emf is 1000 Hz. Then

(a) when frequency = 900 Hz, then the current through the voltage source will be ahead of e.m.f. of the source

(b) the impedance of the circuit is minimum at f = 1000 Hz

(c) at resonance the voltage across L and current in C differ in phase by 180°

(d) If the value of C is doubled resonance occurs at f = 2000 Hz

(1) only a & b are correct

(2) a, b, c are correct

(3) c & d are correct

(4) all are correct

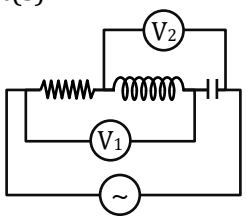
2. If R, C, and L be the resistance, capacitance, and inductance in the circuit in which ac of frequency f is set up, then which of the following have the dimensions of R?

(a) fC (b) fL (c) 1/fC (d) L/f

(1) only a & b (2) only b & c

(3) only c & d (4) all

3. In an RLC series circuit shown in figure, the readings of voltmeters V_1 and V_2 are 100 V and 120 V respectively. The source voltage is 130 V. For this situation mark out the correct statement(s).



(a) Voltage across resistor, inductor and capacitor are 50 V, 86.6 V and 206.6 V, respectively

(b) Voltage across resistor, inductor and capacitor are 10V,90 V and 30 V, respectively

(c) Power factor of the circuit is $\frac{5}{13}$

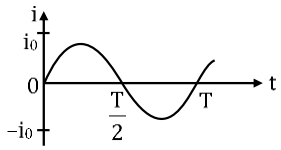
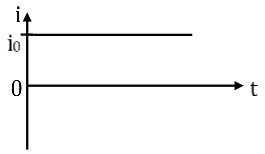
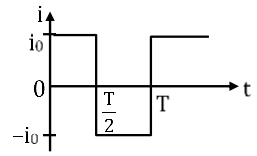
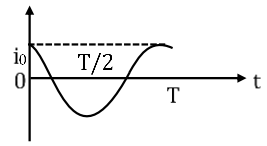
(d) The circuit is capacitive in nature

(1) a, c, d (2) b, c, d

(3) c, d (4) None

4. Match the column :

In column I, variation of current I with t is given in figures. In column II root mean square current i_{rms}, and average current are given. Match the column I with corresponding quantities given in Column II

	Column-I		Column-II
(A)		(P)	$i_{rms} = \frac{i_0}{\sqrt{2}}$
(B)		(Q)	Average current is i_0
(C)		(R)	$I_{rms} = \frac{i_0}{\sqrt{3}}$
(D)		(S)	None of above

(1) a – S, b – Q, c – Q, d – P

(2) a – P, b – Q, c – S, d – P

(3) a – Q, b – P, c – R, d – S

(4) a – P, b – P,Q, c – P, d – P

5. Match the following :

	Column-I		Column-II
(A)	LCR circuits	(P)	Resonant curve will be flattened
(B)	Inductor	(Q)	Sharpness indicates sensitivity
(C)	More resistance	(R)	Have resonant frequency $\omega = \frac{1}{\sqrt{LC}}$ with maximum current
(D)	Radio Tuner's characteristic curve (I – f)	(S)	Analogous to mass

(1) A-R, B-S, C-Q, D-P (2) A-Q, B-P, C-Q, D-R

(3) A-S, B-Q, C-R, D-P (4) A-R, B-S, C-P, D-Q

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6. Match the column

	Column-I		Column-II
(a)	In L-R series AC circuit	(p)	Current lags voltage by $\pi/2$
(b)	In R-C series AC circuit	(q)	Current lags voltage by an angle less than $\pi/2$
(c)	In L-C series AC circuit ($X_L > X_C$)	(r)	Current leads voltage by an angle less than $\pi/2$
(d)	In purely resistive AC circuit	(s)	Current and voltage are in phase

(1) a-q, b-r, c-p, d-s (2) a-s, b-q, c-p, d-r
(3) a-s, b-r, c-q, d-p (4) a-p, b-s, c-r, d-q

7. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Smaller the band width, sharper the resonance and easier it is to tune an LCR circuit.

Reason (R) : Resonant frequency is arithmetic mean of half power frequencies.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

8. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : The impedance of series L-C-R circuit can be greater, equal or less than the resistance.

Reason (R) : The impedance of series LCR circuit depends over angular frequency of applied emf.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

9. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : In a series LCR circuit at resonance, the voltage across the capacitor or inductor may be more than the applied voltage.

Reason (R) : At resonance in a series LCR circuit, the voltages across inductor and capacitor are equal & 180° out of phase.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

10. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Average power consumed in an ac circuit is equal to average power consumed by resistors in the circuit.

Reason (R) : Average power consumed by capacitor and inductor is zero

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

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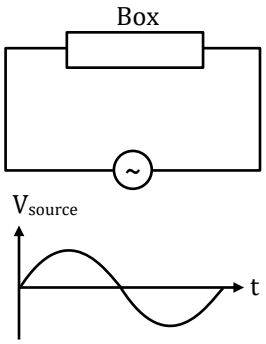
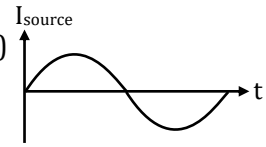
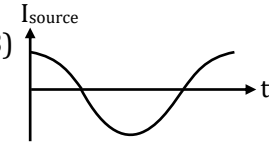
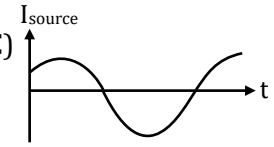
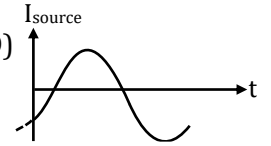
11. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.
Assertion (A) : In an LC oscillation energy is not constant practically.
Reason (R) : Energy is lost in resistance of inductor and of connecting wires and also in form of electromagnetic radiations.
In the light of the above statements, choose the most appropriate answer from the options given below:
(1) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
(2) Both **(A)** and **(R)** are true and **(R)** is NOT the correct explanation of **(A)**.
(3) **(A)** is true but **(R)** is false.
(4) **(A)** is false but **(R)** is true.

12. Box may have any series combination of L, C and R. Column-I represents source current and column-II represents possible statements.



Column-I	Column-II
(A) 	(P) Box may contain LCR.
(B) 	(Q) Box may contain only LR.
(C) 	(R) Power factor of box is zero.
(D) 	(S) Box may contain only CR.
	(T) State of resonance.

Options :-

(1) A → P, B → R, C → PS, D → P
(2) A → PT, B → R, C → PS, D → PQ
(3) A → PT, B → PR, C → P, D → PQ
(4) A → P, B → PR, C → P, D → T

EXERCISE-III (Analytical Questions) ANSWER KEY

Question	1	2	3	4	5	6	7	8	9	10	11	12
Answer	1	2	1	2	4	1	2	4	2	1	1	2